

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KOICHIRO TANAKA

Appeal 2007-0832
Application 09/842,797
Technology Center 2800

Decided: January 23, 2008

Before ANITA PELLMAN GROSS, ROBERT E. NAPPI,
and MARC S. HOFF, *Administrative Patent Judges*.

GROSS, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Tanaka (Appellant) appeals under 35 U.S.C. § 134 from the Examiner's Final Rejection of claims 1 through 30. We have jurisdiction under 35 U.S.C. § 6(b).

Appellant's invention relates generally to a method of making a semiconductor device. The method includes forming a first and a second crystalline region by irradiating a semiconductor film with a laser beam. The laser beam is moved in a first direction for irradiating the first region

and in a direction parallel to the first direction for irradiating the second region. The first region overlaps only a portion of the second region along the first direction. Claim 1 is illustrative of the claimed invention, and it reads as follows:

1. A method of fabricating a semiconductor device comprising the steps of:

forming an amorphous semiconductor film having an upper surface;

forming a first crystalline region by irradiating a laser beam to a first region of the upper surface of the amorphous semiconductor film by relatively moving the laser beam in a first direction with respect to the first region of the amorphous semiconductor film; and

after forming the first crystalline region, forming a second crystalline region by irradiating the laser beam to a second region of the upper surface of the amorphous semiconductor film including a portion of the first crystalline region by relatively moving the laser beam in a direction parallel to the first direction with respect to the second region of the amorphous semiconductor film;

wherein:

a wavelength of the laser beam falls in a range of 370 nm through 650 nm,

the first region of the upper surface of the semiconductor film overlaps with only a portion of the second region of the upper surface along the first direction.

The prior art references of record relied upon by the Examiner in rejecting the appealed claims are:

Yamazaki (Yamazaki I)	US 5,365,080	Nov. 15, 1994
Yamazaki (Yamazaki II)	US 5,893,730	Apr. 13, 1999

G. Andra, *Laser Induced Crystallization: A Method For Preparing Silicon Thin Film Solar Cells*, IEEE, 639-42 (1997).

Claims 1 through 18 and 25 through 30 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamazaki I in view of Andra and Appellant's Admitted Prior Art.

Claims 19 through 24 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamazaki I in view of Andra, Appellant's Admitted Prior Art, and Yamazaki II.

We refer to the Examiner's Answer (mailed June 13, 2006) and to Appellant's Brief (filed March 28, 2006) and Reply Brief (filed August 11, 2006) for the respective arguments.

SUMMARY OF DECISION

As a consequence of our review, we will reverse the obviousness rejections of claims 1 through 30.

OPINION

Appellant contends (Br. 2-3) that Yamazaki I, Andra, and the admitted prior art do not teach or suggest forming two crystalline regions using the same laser beam, as recited in each of independent claims 1 through 6. Further, Appellant contends (Br. 3-4) that Yamazaki I, Andra, and the admitted prior art do not teach or suggest a first region overlapping only a portion of a second region along the direction in which the laser beam moves, as recited in each of independent claims 1 through 6.

The Examiner asserts (Ans. 6) that Yamazaki I discloses forming the two crystalline regions using the same laser beam, but using different pulse

durations. Further, the Examiner asserts (Ans. 7) that Appellant's admitted prior art Figures 4(A)-4(C) show the first region overlapping only a portion of the second region "in a first direction." Accordingly, the issues are whether the combination of references teaches or suggests: 1) using the same laser to form two crystalline regions and 2) overlapping the first region with only a portion of the second region along the direction in which the laser beam moves.

As to the first issue, Yamazaki I discloses (col. 4, ll. 51-57) that the two laser annealing steps are accomplished using different wavelengths of laser radiation "or different pulse durations of pulsed laser." Thus, although we agree with Appellant that the majority of Yamazaki I's disclosure, and particularly Yamazaki I's examples, suggests using two different lasers, Yamazaki I expressly discloses that an alternative is to make the two pulse durations different.

Regarding the second issue, Figure 4(A) of the admitted prior art shows irradiating in the horizontal direction, but a partial overlap of the two regions in the vertical direction. Thus, the partial overlap is not along the direction in which the laser beam moves. In the horizontal direction, the direction in which the laser beam moves, the overlap between the two regions extends across the entire second region. None of the admitted prior art shows the overlap between the two regions in the same direction as the movement of the laser. Further, Yamazaki I discloses region one overlapping all of region two rather than only a portion thereof, and Andra does not discuss an overlap of two regions. Therefore, since none of the prior art applied against the claims discloses or suggests overlapping the two regions in the direction in which the laser moves, the combination likewise

cannot teach or suggest the claimed overlap. Accordingly, we cannot sustain the obviousness rejection of independent claims 1 through 6 nor of their dependents, claims 7 through 18 and 25 through 30.

Regarding claims 19 through 24, the Examiner (Ans. 5) adds Yamazaki II to the primary combination to show that semiconductor devices are used in video cameras, personal computers, etc. Yamazaki II, however, fails to cure the deficiencies of Yamazaki I, Andra, and the admitted prior art. Therefore, we cannot sustain the obviousness rejection of claims 19 through 24.

ORDER

The decision of the Examiner rejecting claims 1 through 30 under 35 U.S.C. § 103 is reversed.

REVERSED

Tdl/gw

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